

REMARKS

By the present amendment, claim 1 has been amended to correct an article in the second paragraph of claim 1 (“the” instead of “a” before “rich-mixture regeneration operating mode”).

Also, new method claims 20-22 have been added. Claim 20 corresponds to system claim 1 and recites corresponding technical features. Claims 21-22 correspond to claims 2 and 5, respectively, but depend on claim 20. Since the present application is a national stage of a PCT application, it is submitted that claims 1-22 should be examined together under the “unity of invention” rule (See Rule 13 PCT and MPEP 1893.03(d)).

Claims 1-2, 4-5, and 7-22 are pending in the present application. Claims 1 and 20 are the only independent claims.

In the Office Action, claims 1-2, 4, 7-8, 12-13, 15, and 19 are rejected under 35 U.S.C. 103(a) as obvious over US 6,901,747 to Tashiro et al. (“Tashiro”) in view of US 6,491,016 to Buratti (“Buratti”).

Further, in the Office Action, claims 5, 9-11, 14, and 16-18 are rejected under 35 U.S.C. 103(a) as obvious over Tashiro in view of Buratti and further in view of US 6,082,325 to Digeser et al. (“Digeser”).

It is acknowledged in the Office Action that Tashiro does not disclose the at least two pilot injections and the main injection at the crankshaft angles as in the present invention, but it is alleged that Buratti discloses these features, so that it would have been obvious to use these features of Buratti in the system of Tashiro “since the use thereof would have improved the vehicle drivability by reducing engine noises” (Office Action at page 3, second paragraph).

The rejections are respectfully traversed. Buratti does not teach or suggest two pilots and a main injection in a rich-mixture regeneration operating mode, as in the present invention.

Specifically, Buratti discloses six possible injections: first preinjection PILOT, second preinjection PRE, first main injection MAIN1, second main injection MAIN2, first postinjection AFTER, and second postinjection POST. The PILOT and PRE may both be between 60 to 0 degrees before the TDC and the MAIN1 and MAIN2 may start from 30 before to 10 after the TDC (see Buratti at col. 3, lines 10-14, 18-20, 44-46 and 54-56).

However, Buratti does not suggest using both PILOT and PRE in rich mode intended to regenerate the NOx trap. Namely, the only situations disclosed in Buratti with both PILOT and PRE are the first strategy for startup, the fifth strategy for break-away or warm-up, and the sixth strategy for high-torque, low-engine-speed (see Buratti at col. 6, lines 1-4, 24-28, and 29-32).

In particular, the fourth injection strategy of Buratti is for reducing nitric oxides NOx and seems to correspond to a rich mode stage for regeneration of the NOx trap. This fourth strategy uses only one preinjection PRE “to reduce noise” and two main injections MAIN1 and MAIN2 “to reduce nitric oxides NOX, and one postinjection AFTER “to reduce particulate matter (Buratti at col. 6, lines 19-23).

It is noted that US 6,491,016 to Buratti has a common inventor with US 6,666,020 to Tonetti which was cited in the first Office Action. Tonetti describes various particle filter regeneration strategies which are indicated to be improvements over the basic system of Buratti

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(the description of Tonetti refers to the EP publication corresponding to the US patent to Buratti). Thus, the presently claimed invention is distinguished from both Tonetti and Buratti.

Namely, in the presently claimed invention, the rich-mixture regeneration operating mode provides that at least two pilot injections can be triggered in a crankshaft angle range from approximately 50° to approximately 5° ahead of the top dead centre point of the cylinder concerned, and a main injection can be triggered in an undercalibrated range up to a crankshaft angle of approximately 35° after the top dead centre point, as recited in present claims 1 and 8.

An advantage of the presently claimed invention is that it makes it possible to improve the regeneration of a NOx trap, where an incomplete combustion can be rather advantageous, and incomplete combustion can be promoted by a degraded ignitionability of the main injection, as explained in the previous response. The features and advantages of the presently claimed invention are not taught or suggested in Tashiro. Further, Digeser and Buratti fail to remedy the deficiencies of Tashiro. Therefore, the presently claimed invention is not anticipated by, and not obvious over, Tashiro.

In addition, with respect to the dependent claims, it is submitted that the combined features of these respective claims are not taught or suggested in Tashiro, and that Digeser and Buratti fails to remedy these deficiencies.

Therefore, each of the dependent claims, and in particular, each of claims 2 and 5, is not anticipated by Tashiro, and is not obvious over Tashiro taken alone or in any combination with Digeser.

In view of the above, it is submitted that the rejections should be withdrawn.

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In conclusion, the invention as presently claimed is patentable. It is believed that the claims are in allowable condition and a notice to that effect is earnestly requested.

In the event there is, in the Examiner's opinion, any outstanding issue and such issue may be resolved by means of a telephone interview, the Examiner is respectfully requested to contact the undersigned attorney at the telephone number listed below.

In the event this paper is not considered to be timely filed, the Applicants hereby petition for an appropriate extension of the response period. Please charge the fee for such extension and any other fees which may be required to our Deposit Account No. 502759.

Respectfully submitted,

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